



**Assessing the economic implications of  
different models for implementing the  
requirement to protect plant varieties**

**Report Work Package 6  
Impacts of the IPR Rules on Sustainable  
Development**

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# INTRODUCTION

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## **1. The research programme<sup>1</sup>**

The project proposal states, “The objective of this Work package is to assess the effectiveness of the regulatory measures employed by EU candidate countries and developing countries to implement Article 27.3(b) as it relates to the protection of plant varieties. The analysis treats plant variety protection as not being an end in itself but as part of a larger policy framework related to economic growth in the agricultural sector. In addition, ‘effectiveness’ is considered from multiple perspectives and not only as a requirement for compliance with international agreements.” This suggests a focus on Article 27.3(b) of the TRIPs Agreement but also requires bringing in the wider policy context of changes in and transformations of the agricultural sector. In addition to this focus, the work package also maps out two broad tasks: beginning with collating and reviewing the relevant literature and followed by country case studies.

The aim of the literature review is to critically analyse the “rich and growing literature on ‘how best to implement Article 27.3(b)’” and to study the “relevant literature on the economic impact of intellectual property rights with respect to plant genetic material”.

The first component of the review<sup>2</sup> focuses on identifying the broad ‘models’ that have been presented as means to implement Article 27.3(b). This will consist of the different instruments (i.e. patents, *sui generis* or combination thereof), the nature of the scope of the rights and other key constituent elements of the architecture of the system of protection (e.g. the standards of protection, the coverage of the system, its relationship with other rights, etc.) Following on from the latter, it will also be necessary to have some – though brief – discussion of closely related issues and developments (e.g. protection of TK, Farmers’ Rights, the FAO International Treaty, etc.).

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<sup>1</sup> A special acknowledgement is made of the research assistance of Priscillia Hunt (Warwick University) in preparing this report.

<sup>2</sup> This has been prepared by Queen Mary.

The second component of the literature revolves around the ‘implementation models’ and focuses on the economics of intellectual property in this area<sup>3</sup>. The aim of the proposed documentation will be to pull out from the available literature evidence and assessment concerning the ‘impact’ of a set of key features of the different implementation models. In terms of ‘impact’ the review will focus on market-based indicators (price of seeds, firm concentration, etc.), indicators of innovation (new varieties released) and appropriation (breeding techniques), and various structural features (nature of the seed sector, agricultural sector, etc.). The role of related regulatory systems (e.g. seed certification) will also be noted.

The case studies seek to adopt a broad template. The work on the case studies will be spread out between primary research (field-work based country case studies), analysis of primary data (economic, legal and qualitative) and secondary research; in particular, some of the case studies will be based on field work whereas other country studies will be exclusively based on secondary literature. Using the base of the literature review where (a) the models have been identified and (b) evidence of impact observed; the case studies will assess the experience of the countries and present evidence of the economic impact of protecting plant varieties. In particular, it will focus on the impacts on the relevant interest groups (farmers, breeders – public and private, seed merchants), and on the wider economy. The following were the field-work based studies: Bulgaria, Ethiopia and Kenya. And, these are the secondary literature based studies: China, India and Turkey.

The remainder of this report summarises the main findings of the country case studies. All documents are available at the IPDEV project website, <http://www.ip4development.org/>. These documents include the background literature reviews for the law and economics of plant breeders’ rights, each country case study and the final report of work package (i.e. this document).

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<sup>3</sup> This has been prepared by Warwick University.

# CASE STUDY ON BULGARIA

## IP Bulgaria

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### **1. Introduction**

The foreign trade balance of the Republic of Bulgaria was negative in 2004 amounting to 3 900 million BGN, and increased by 622 million BGN compared to the same period in the previous year. Foreign trade in agricultural commodities for 2004 ended with a positive trade balance amounting to just over \$247 million US. The gross added value from the agrarian sector was 2.2% and its share of added value to the economy was 10.9%. The relative share of gross value added created in the agrarian sector maintained a downward trend – from 13.4% in 2001, 12.1% in 2002, 11.6% in 2003 down to 10.9% in 2004.

According to the provisions of the Law for support of the agricultural producers, a register of agricultural producers was established and is functioning at the MAF. The registration is more of an obligation than a recommendation since it is a necessary condition for access to the financial support by State Fund Agriculture and SAPARD program. Over the period 2007-2009, around 1.8-2 billion Euro in the form of direct financing will be received in the country. In order to have access to these subsidies, the agricultural producer will have to be registered with a special form in the national register. By 19/09/2005, the registered agricultural producers, physical and legal bodies were 64 127.

The non-cultivated lands in 2004 amounted to 455 000 ha and were 7.9% of the areas with agricultural purpose. Comparing with the previous year, non-cultivated lands remained nearly the same size.

### **2. Intellectual Property Laws and Regulations**

The new Bulgarian Law on Protection of New Plant Variety and Animal Breeds (hereinafter referred to as "Plant Variety Law") entered into force on January 4, 1997. This Law introduces a *sui generis* system of plant variety protection and brings it in accordance with the relevant international standards, in particular with the UPOV Convention and the system of Community plant variety protection (Council Regulations (EC) No. 2100/94). The subject matter of protection covers created or discovered and developed plant varieties of all botanical genera and species, including clone, line,

hybrid between genera or species and root stock, irrespective of the method (artificial or natural) of their production. The full case study includes an in-depth description of the legislation wherein the close compatibility and correspondence with UPOV is apparent in key areas: the conditions for grant of protection, the scope of protection and others measures. Also included are the procedures for a grant, procedures for obtaining protection, assignment of licenses, scope of rights, limitation of scope of rights, and duration of protection. The descriptions include ministries, courts, and agencies involved in the completion of intellectual property right protection.

In March 2003, Bulgaria activated and has since continued to implement a new Plant Variety Law on seed and propagating material, which is harmonised with the EU-directives related to the production and trade of seed and propagating material, variety testing and keeping a variety register. The Minister of Agriculture and Woodlands realises fulfilment and control of these activities through its Executive agency of variety testing, sampling and seed control (IACAC) and National services for plant protecting (HCP3). The Law permits regulation, means of enrolment, and quality control such that the seed and propagating material is traded only if it is from the varieties enrolled in the official variety list. The list is separated into a list "A" and "B", each of which contains specific types of plants meeting requirements for biological and economic properties. Enrolled varieties may be dealt with if they meet exception requirements (details of which are presented in the full report). In addition, the report contains a detailed listing of questions under variety data and testing. The varieties are enrolled for 20 years for fruit species and vines and 10 years for the other vegetable species. After expiry, the varieties may be enrolled for the next period if they still meet the requirements. Included in the report are conditions and requirements for the certification, production, and import/export of seed and plant material.

While the substantive laws on IP protection by and large comply with international standards, the EC Commission still sees some deficits in the field of enforcement. Reasons can be found in the insufficient capacities of administration and judiciary, and the lack of specific training in this field. Sofia Court and the Patent Office are responsible for enforcement activities. In some respects, the Sofia City Court is a special court since according to Sec. 64 Judiciary Act, it is the only city court in Bulgaria and a District Court.

### **3. Use and Practical Aspects**

Approbation and seed grading focus on the following areas: Field inspections (approbation) of seed-producing and propagation crops intended to certify the quality of seeds and propagation material; seed and propagation material grading and issuance of certificates required for domestic and export trade; Ground control tests (zonal field tests) and laboratory tests intended to determine the authenticity and purity of tested varieties of seeds and propagation material; Control on production, storage, handling, marketing and planting of seeds and propagation material. In 2000, the government structures involved assessed 398 plant varieties for DHS (distinction, homogeneity and stability) and further 814 varieties for BEQ (bio-economic qualities) including 703 field crop varieties, 101 vegetable varieties and 10 permanent crop varieties.

The Official variety list of 2002-2003 is an objective source of information about the current economic and legal status of the new plant varieties protection as an object of intellectual property. Each plant or fruit/vegetable of the official variety is listed in the full report, along with the number of protected varieties in each list ("A" or "B"). During January 1 – July 31, 2001, 84 contracts for formal variety testing were signed: 43 with local customers, 30 with foreign customers and 11 with private variety testing laboratories.

The number of IP cases is rising. While there were 21 cases in 1995, the number had risen to more than 150 in the year 2000. This is still an insignificant number, compared to the 500 to 600 cases a judge at the Sofia City Court has to deal with annually.

### **4. Conclusion**

Most owners of protected varieties are governmental institutes, which currently have economic difficulties and no resources for financing of new selections. Authors in the full report suggest the effective use of the protected varieties is of great importance to their survival as a scientific potential. The status of legal protection of foreign varieties in Bulgaria indicates that major private breeders do not protect their varieties with Bulgarian certificates. From the accepted 303 foreign "list A" varieties in 2004, none are protected as an object of intellectual property rights. Nevertheless, the varieties are on the Bulgarian market. From the enrolled 9 foreign varieties in the Bulgarian patent office, the owners of 8 of them refused their varieties to be accepted in the Bulgarian official list for 2004. Authors suggest this unpleasant result is due to hybridisation

("natural" protection), lack of production investment by large firms, and lack of climate information in Bulgaria.

# CASE STUDY ON ETHIOPIA

By Muriel Lightbourne, Queen Mary

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## 1. *Introduction*

This study differs from the others in focussing mainly on a single crop: coffee. In the course of the lengthy negotiations of the FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR), adopted in November 2001, the Ethiopian government decided not to include coffee in the list, annexed to the treaty, of plants covered by the multilateral system of free germplasm flow. The rationale for this decision was that the Convention on Biological Diversity (CBD) gave the opportunity for genetic resources-rich countries to enter bilateral agreements to value their genetic resources. In 2005, the Government of Ethiopia prepared many Proclamations, Regulations and Guidelines dealing with biosafety, traditional knowledge, and plant breeders' rights, with a view to implementing the CBD, the Cartagena Protocol to the CBD, and to joining the World Trade Organization, where Ethiopia has an observer status.

Agriculture accounts for 45% of the Ethiopian GDP, 80% of total employment and 85% of exports (75% according to AfDB-OECD 2005). The total exports of Ethiopia rose from US\$ 452.3 million in the fiscal year 2001-2002, to 600.7 in 2003-2004. Coffee represents one third of total exports.

Overseas Development Aid received by Ethiopia has risen from US\$ 925 million in 2000 to US\$ 1,920 in 2003, of which on average 33% are allocated annually to humanitarian assistance, compared to 6% to agriculture and 10% to transport infrastructure. The proportion of food aid to food grain production decreased from 12.6% in 1984-85 to 7.1% during the period from 1991-92 to 1999-2000. The nature of food aid changed as well: whereas the bulk of food aid was in kind until 1994-1995, which had an adverse effect on domestic food prices and food production, it now tends to be replaced with aid in cash. However, with a population growth of 2.9% per year and the overall cereal production increasing by 1.7% per year, Ethiopia is not self-sufficient.

Under the Derg regime, the state-owned Ethiopian Seed Corporation was the sole distributor of seeds produced by itself or state farms. Although prices were kept low,

farmers would rather resort to saved seeds of local varieties. The ESC was restructured and renamed as the Ethiopian Seed Enterprise (ESE) in 1993. Prices were deregulated and the private sector was allowed to participate in the production of improved seeds. Nonetheless, the market for improved seeds remains concentrated with the ESE providing more than 90% of improved seeds. The annual seed needs of Ethiopia are estimated at 140,000 tonnes, of which 86% are met by farm-saved seeds. Only 29% of grain produced is marketed. Of this, 31.4% are sold directly from producers to consumers, and 35.5% are sold to inter-regional traders.

The ESE is supervised by the Ministry of Agriculture and Rural Development. As already mentioned, its main role consists in providing improved seeds. Actually, this role is three-fold, as it entails breeding, multiplying and distributing improved seeds. These are received both from breeders and from the Ethiopian Agricultural Research Organization. ESE has one protected variety and a keen interest in intellectual property rights, in particular to protect hybrids with a view to export markets. It produces 40,000 – 50,000 quintals of hybrid maize per year, no longer in co-operation with Pioneer Hi-Bred Seeds Ethiopia. Pioneer Hi-Bred Seeds Ethiopia now operates on its own and has registered 2-3 varieties in Ethiopia in order to multiply and sell them in this country.

## **2. Seed Regulations**

The current variety release guidelines have been in use for over two decades. A review is under consideration. The functions of the National Variety Release Committee are:

- To approve the release of hybrids and varieties developed by governmental and private institutions, at least once per year for both the highland and the lowland crops;
- To make the necessary arrangements with foreign and local institutions to conduct quality tests such as oil content, cooking, baking or fibre quality of varieties and hybrids proposed for release;
- To register the released varieties and hybrids;
- To obtain seed of the newly released variety or hybrid from the breeder or the institution that developed it and provide it to the IBCR for long-term storage and maintenance;

- To recall and remove obsolete varieties and hybrids from the list of those eligible for seed certification when sufficient information is available;
- To give periodic review and status report to the National Seed industry Agency (now renamed NAIA).

The criteria for the release of a variety are the following are the basic UPOV ones. However, the requirement of distinctness is a blend of traditional UPOV-like distinctness criterion and of "Value in Cultivation and Use" (VCU) criterion.

The Seed Proclamation no 206/2000 deals with seed certification. The rationale for its adoption is "the need for creating a legal framework for the protection and control of the interests of users, originators, processors, wholesalers, and retailers of plant seeds." Art. 3 of the Proclamation states that the provisions of this proclamation shall not apply to seeds produced by a farmer, and sold directly to another farmer, neither to seeds intended for other purposes than planting. The Seed Proclamation provides further that research organisations, both public and private, shall import or export varieties for research purposes only after obtaining a permit from the NAIA and where these satisfy the requirements of the Plant Quarantine Regulations.

Seeds that are genetically modified shall be imported only if the NAIA is satisfied "that these seeds or planting materials are in conformity with the laws issued regarding the importation of genetically modified plants and other pertinent directives." Moreover, "[n]o person shall import and sell seed whose second generation seed cannot germinate or seed which has terminator gene technology."

Proclamation no 123/1995 concerning inventions, minor inventions and industrial designs excludes from patentability "[p]lant or animal varieties or essentially biological processes for the production of plants or animals."

The Proclamation on Plant Breeders' Rights was adopted on 3 January 2006. Members of the Rural Development and the Natural Resources and Environmental Protection Standing Committees of the House of Peoples' Representatives considered that the proclamation would encourage farmers and pastoralists to use their genetic resources, while encouraging the private sector to release new plant varieties suitable for the varied ecosystems of Ethiopia and facilitating the use of new plant varieties released abroad. On the same day, the Proclamation to provide for access to genetic

resources and community knowledge and community rights was also endorsed. This proclamation draws on the African Unity Model Law on Rights of Communities, Farmers, Breeders, and Access to Biological Resources.

### **3. *Focus on the coffee market***

Ethiopian germplasm constitutes the genetic base of most of arabica coffee produced in Latin America and Asia, exposing coffee production to the threat of disease outbreaks, such as the Coffee Berry Disease that wiped out an important proportion of Ethiopian coffee areas. In 1971 or the coffee leaf rust outbreak which resulted in the termination of coffee production in Sri Lanka. Maintaining this germplasm is thus paramount.

Coffee production involves over a million farming households (with land plots of 0.5 ha in average) and about 25% of the population of the country. Roughly 500,000 hectares of land are occupied by coffee, with elevations ranging from 550 to 2400m. Annual coffee production varies between 300,000-330,000 tonnes, which corresponds to an average yield of 600 kg/ha. Although Ethiopia is the first African coffee producer, it accounts for only 3% (4% in 2004) of the global coffee market.

The strategy followed by the Oromia Coffee Union seems to be the best way to promote and upgrade Ethiopian coffee, through certification and fair trade. In respect of certification, the WTO Agreement on rules of origin may have an impact.

The views of coffee brewers on this issue differ from those of coffee producers. Coffee roasters oppose a possible labelling requirement including the indication of coffee origin, as most of the time, coffee packs are the result of a blending of different coffee types, varying from year to year in order to maintain a given taste despite climate variations, even in the case of pure origins (cf. “pure Ethiopian coffee” or “pure Colombian coffee”). Two difficulties would then arise from their perspective: it would become easier for competitors to copy a popular blend if the different coffee origins and proportions thereof are clearly indicated on labels, and packaging and labelling would have to change yearly (owing to the necessity to change the respective proportions of different coffee types following the conditions of production), which would generate additional costs. In the case of “Carte Noire” coffee, which represents roughly 25% of all coffee packs sold in France, 20 different origins are present.

Rather than focusing on rules of origin and labelling requirements with their negative impact on competition, it might be preferable at the international level to push for a broadening of TRIPs Art. 23 special protection for wines and spirits by geographical indications to other products, in particular coffee, in addition to implementing domestic legislation on access and benefit-sharing.

# CASE STUDY ON KENYA

By Dwijen Rangnekar, Warwick University

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## *1. Introduction*

This is a study of the ‘impacts’ of implementing Article 27.3(b) of the TRIPs Agreement in Kenya. The study looks at how the international obligation is translated into the architecture of domestic law and analyses the economic changes that have occurred in plant breeding and the seed industry. Kenya is a useful choice as it has a ‘relatively’ long history with regulations in the area of plant varieties and seeds and it has been integrated into global supply chains in horticulture and floriculture. Agriculture has central significance in Kenya, not only does it support over 70% of the population but it is also a leading export earner. At the TRIPs Council, Kenya has regularly opposed the strengthening of existing obligations with respect to plant variety protection (in Article 27.3b). Consequently, studying the way in which this obligation to the TRIPs Agreement is domestically implemented can be a prism into how different domestic (and international) constituencies are handled.

## *2. Background*

Kenya is an agrarian-based economy with over 60% of the population classified as rural. Agriculture’s share of the GDP is substantial, though it has fallen from nearly 40% in the 1970s to 25% in 2000. Yet, agriculture retains its importance not only as a source of livelihood (some 75% of the total labour force) but also as an export earner (about 70% of total exports). Significantly, it is small-holder agriculture that account for 75% of total agricultural production and 60% of the export-oriented horticulture and ornamental sector.

Maize is by far the leading crop of cultivation accounting for upwards of 30% of total cropped area. Production has stagnated with growth at 1.05% between 1990 and 2005. Yields have fallen from 1.76 tonnes per hectare in the 1990/94 period to 1.51 in 2000/04. Horticultural crops and flowers now account for short of 30% of the cropped area with vegetables alone accounting for 22%. Between 1974 and 2000, there has been a four-fold increase in their export value and exports are now valued at US\$167Mn. Coffee and tea together account for some 5-6% of the area. After tourism

and tea, horticultural exports are the third largest export-earner; thus, displacing coffee from its position.

### Seed industry

Till recently, seed production has been the province of the parastatal Kenya Seed Company (KSC). It was endowed with a legal monopoly to grow, process and sell certified maize seed. It also had exclusive rights to the multiplication and production of varieties bred by the Kenya Agriculture Research Institute (KARI).

As part of economic reform in the early 1990s, the seed sector was opened up to the private sector. Simultaneously, the exclusive right that KSC had to KARI varieties was terminated. Many seed companies have entered the market and presently there are 55 registered seed companies.

Of the total maize seed market, it is estimated that just over 45% is commercial maize seed. Despite the opening up of the seed market, KSC continues to retain its dominating position and accounts for 86% of the maize seed market (Table 1). Other crops where commercial seed sales occur are in the various fruits and vegetables

**Table 1: Maize Seed Data**

Company	Seed Volume (1000Kgs)	Seed Sales (K£ Mn)	Market Share
Kenya Seed Company	25933.97	15.00	86.49%
Western Seed Company	666.27	0.60	3.46%
Faida Seed	0.00	0.55	3.17%
Farmchem	296.19	0.30	1.71%
Pannar	430.22	0.43	2.48%
Lagrotech	5.66	0.24	1.38%
	0.00		
Total	27576.66	17.34	

*Note:* (1) Seed volumes based on Kephis certified seeds (2003). (2) Seed sales are estimated figures. *Source:* Ministry of Agriculture (2004)

that constitute the horticultural sector and certain oilseeds (e.g. sunflower). However, this is a relatively small market as over 70% of vegetable seed is imported.

### Plant Breeding

Plant breeding is largely a public sector activity that is centrally coordinated by KARI and implemented through a range of domestic and international public sector institutions that include the Kenya university system, the International Agricultural Research Centres (IARCs) and a host of commodity boards. KARI's research expenditures have increased from K£40Mn in 1990/91 to K£74Mn in 1997/98. There has been an increase in the share from the public exchequer (now, 52%) so as to

reduce the heavy reliance on donor funding as that tends to be project driven. Yet, there has been a secular decrease in research intensity which has fallen from 2.01 in 1991/92 to 1.05 in 1997/98.

Breeding activities in maize can be analysed through the varieties released. Between 1964 and 2003 there were over 80 varieties released of which 86% were released in recent years (1994/2003) and are heavily oriented towards hybrids. Only 11 varieties were open-pollinated varieties.

### **3. Overview of Regulations and Laws**

Article 27.3(b) is a rare instance of intra-Quad differences, which in this case reflects the exclusion of plant varieties from patents as provisioned in the *European Patent Convention*. Consequently, the obligation allows for different legal practices and the space for imaginative law-making. Kenya has led the Africa Group at the TRIPs Council in advocating a ‘no patents on life’ position. Hence, the curiosity of how this Geneva rhetoric matches up with domestic law-making. Unfortunately, none of the Geneva rhetoric has filtered into the relevant domestic legislation. Moreover, the decision to accede to the 1978 Act of the *International Union for the Protection of New Varieties of Plants* (UPOV) – Kenya acceded in April 1999 – has constrained the space for legal imagination. In particular, a strong case for a cognitive lock-in to the architecture of laws established in Europe.

The *Seeds and Plant Varieties Act, 1972* provides the legal framework for plants and seeds. Provisions for PBRs were enacted through the *Seeds and Plant Varieties (Plant Breeder’s Rights) Regulations, 1994* and are administered by the Plant Variety Rights Office at the Kenya Plant Health Inspectorate Service (KEPHIS). The Act establishes regulatory framework for transactions in seeds; thus introducing provisions for the registration of seed growers and seed merchants; creating an Index of Names of Plant Varieties; and rules concerning the selling of certified and tested seeds. The seed testing and certification system is to be administered by a *Seed Regulation Committee* (the Regulation, Section 5, passim). Part VI of the Act makes provisions for a *Seeds and Plants Tribunal*. While the Committee has rarely been convened, the Tribunal was only established in September 2006.

Within Kephis is the Plant Breeders’ Rights Office that administers the PBR system. In 1997, the first applications were accepted and the first grants were issued in 2003. In

1996, UPOV reviewed Kenya's law for conformity and placed accession contingent on the execution of three changes. One of these required the deletion of a test for agroecological value as part of the tests for distinctness, uniformity and stability that collectively formed the conditions for grant of protection. These amendments were made; thus, Kenya's law is very similar to the UPOV template in key features like the conditions for grant, the scope and duration of protection, exemptions from the right and provisions for stronger rights. Like in the 1978 Act of UPOV, there is no explicit exemption for farmer seed saving/exchanging. The Act in Section 20(5)(a) says that 'the sale of reproductive material of a protected variety does not imply that the breeder authorises the purchaser to produce the reproductive material that was sold to him'. However, a farmer is prohibited from selling seeds because of the requirement to obtain seed certificates.

Kenya's first national patent law was passed only in 1989: the *Industrial Property Act of 1989*. On account of obligations arising out of the TRIPs Agreement, the *Industrial Property Act, 2001* was passed. Section 26 follows a well-established routine of attempting to demarcate and differentiate juridical space that would map onto biological space in terms of 'essentially biological' and 'microbiological'. This route was pioneered in the *Strasbourg Convention* and it continues in the *European Patent Convention* and most recently in the *Trade-Related Intellectual Property Rights Agreement*. Section 26(a) states that non-patentable inventions include "plant varieties as provided for in the Seeds and Plant Varieties Act, but not parts thereof or products of biotechnological processes". This is found to be legally ambiguous as it could be argued that plant varieties not provided for can be patentable subject matter.

Overall, the legal framework is an import of the European system and demonstrates the remarkable distance between *Geneva-rhetoric* and domestic reality.

#### **4. *The Impacts of Implementation Models***

The economic literature on PBRs is not as theoretically sophisticated as the literature on patents; instead it tends to be empirical and case study based. With the first applications received in 1997 and grants issued in 2003 there is very little data for analysis. Additionally, the data collected was not sufficiently disaggregated. Consequently, the research seeks to map out emergent trends. In the few years of operation there have been a sizeable number of applications (Table 2). This, in a limited sense, is confirmation of confidence in the system amongst potential right-

holders. Two emergent trends are noticeable: (a) resident and non-resident distribution and (b) the crop focus. While Kenyans collectively account for the largest share of applications (52%) there are leading shares held by applicants from the Netherlands (25%), Germany (16%) and Italy (10%).

**Table 2: Kenya PBR Activity, 1997-2004**

Year	Applications			Grants		
	Residents	Non-residents	Total	Residents	Non-residents	Total
1997	11	128	139	0	0	0
1998	42	33	75	0	0	0
1999	16	45	61	0	0	0
2000	24	45	69	0	0	0
2001	164	33	197	0	0	0
2002	11	27	38	0	0	0
2003	7	25	32	32	77	109
2004	16	45	61	0	41	41
<b>Total</b>	<b>291</b>	<b>381</b>	<b>672</b>	<b>32</b>	<b>118</b>	<b>150</b>
	<b>43.30%</b>	<b>56.70%</b>		<b>21.33%</b>	<b>78.67%</b>	

(a) Five grants ceased to be in force; thus total grants at the end of the year would be 36

Source: Kephis (various years), *Annual Report*; supplemented by UPOV (2005a), *Plant Variety Protection Statistics*, C/39/7.

The crop-wise distribution by nationality of applicant is one way to assess this evidence (Table 3). Even a cursory look at the table reveals a striking socio-technological division of labour between nationals and non-nationals:

- PBRs applications by residents are exclusively in cereals, industrial crops, oil crops and pulses
- Applications for PBRs by non-resident are exclusively in vegetables and ornamentals

Table 3 also shows the large share of applications in ornamentals (43%), in particular roses (37%). This corresponds with the growth of the cut-flower industry in Kenya that has also made it the largest exporter of cut-flowers to Europe. However, the particular role and impact of IPRs in this transformation remains unclear. Studying the phenomenal growth of the fresh fruit and vegetables sector, analysts have identified a number of drivers: geography and climate, demand and infrastructural spin-offs from tourism industry, effective and flexible private sector entrepreneurs, and stable,

supportive policy environment. Notable in absence is any reference to Kenya's intellectual property policy or a reference to the agricultural research climate. Though PBRs have been applied for, it is clear that the industry grew with a system of informal self-regulation and has developed effective surveillance of the supply chain.

**Table 3: Crop-Wise Distribution of Applications, 1997-2004**

	Residents	Non-residents	Total	%age Share
<b>Cereals</b>				
Maize	55	0	55	8.18%
Wheat	30	0	30	4.46%
Sorghum	7	0	7	1.04%
Barley	7	0	7	1.04%
<b>Industrial Crops</b>				
Tea	33	0	33	4.91%
Pyrethrum	23	0	23	3.42%
Macadamia Nut	11	0	11	1.64%
Sugarcane	6	0	6	0.89%
<b>Oils</b>				
Rapeseed	0	14	14	2.08%
Sunflower	10	0	10	1.49%
Soybean	7	0	7	1.04%
<b>Pulses</b>				
Dry Beans	13	0	13	1.93%
Peas	0	7	7	1.04%
<b>Pasture crops</b>	10	0	10	1.49%
<b>Vegetables</b>				
French Bean	0	14	14	2.08%
Potato	4	0	4	0.60%
Cassava	2	0	2	0.30%
<b>Ornamentals</b>				
Rose	0	247	247	36.76%
Alstroemeria	0	28	28	4.17%
Limonium	6	8	14	2.08%
<b>Total Applications</b>			<b>672</b>	<b>100%</b>

*Source:* Author's calculations from Kephis data

A final theme of analysis concerns the public sector. Here, a key issue relates to the protection of varieties bred by KARI and its licensing policy. At the time of research, KARI was will debating these questions. However, strong indications of a move to use PBRs as a revenue generating exist in that the exclusive license to KSC has been terminated and applications for protection lodged. Projections of a royalty stream that

contribute 8% of the operating income have been made. Caution must be sounded on this option and the projections. Effective use of PBRs requires significant investments in enforcing rights and marketing the same which may prove to be a drain on public resources. Concern about the impact of this policy on the competitive structure of the seed industry remains. Kenya has a relatively high seed-grain price ratio (4.5, compared to 1.7 in Zimbabwe) and with profits at 10-20% the market has an oligopoly structure. KARI's license policy could further aggravate this situation by hindering the entry and participation of new seed firms.

Finally, it remains to be seen whether the introduction of plant breeders' rights will actually respond to the productivity crisis in maize. Equally, is the issue of diffusion of technology in either the horticultural sector or in novel biotechnology areas.

## CASE STUDY ON CHINA

By Muriel Lightbourne & Lois Muraguri, Queen Mary

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### 1. *Status of Agriculture Research*

Agriculture in China is dominated by the public sector. The main actors in the public sector are institutes under the national agricultural research system and universities. While private spending in agriculture R&D has grown rapidly since 1985, at US\$16 million (in 1995) it represents only 3% of the total agriculture research expenditure with an intensity of 0.008 of total agriculture GDP compared to the government's 0.32.

Investment in agriculture biotech has seen a rapid increase both in terms of staff and expenditure, from US\$4.2 million in 1986 to US\$56 million in 2003. Plant biotechnology research in China includes food crops including some that have received little attention elsewhere demonstrating China's concern in attaining food security. Furthermore, the emphasis in plant biotech in China has been on increasing crop yield and preventing pest outbreaks. Virtually all investment in biotech in China is from the public sector.

### 2. *Broad Models for Implementing Art 27(3)(b)*

The 1978 UPOV Convention became effective in China from 23 April 1999. Before then, China already had Regulations on the Protection of New Varieties of Plants, which were promulgated on 20 May 1997, came into effect in October 1997 but were only implemented after UPOV became effective. Plant varieties can only be protected if they are in the published list of protected varieties. This list is determined and published by the approving authorities.

Beside PVP Regulations, plants may also be subject to patent law and other regulations. Article 25 of the Patent Law states that 'no patent right shall be granted for animal and plant varieties' however, processes used in producing animal and plant varieties may be protected under patent law. Regarding PVP, the patent law may be applied only to the *process* of producing new plant varieties rather than in the protection of the plant varieties themselves.

In addition to the novelty, distinctness, uniformity, stability and adequate denomination test, the plant variety to be protected must be in the list of protected varieties. The transfer or assignment of plant variety rights from a Chinese right holder to a foreigner

requires approval by the examining and approving authorities whereas an assignment within China need be approved only when the relevant national regulations so require. In all assignment cases, a written contract between the parties shall be included in the application for assignment which is in turn published by the examining and approving authorities.

A compulsory license may be granted to exploit new plant varieties in the national or public interest. Quarantine regulations are an important aspect in the process of attaining PVRs particularly for foreign breeders wishing to export a plant variety to China for protection. China has about 15 different laws and regulations on quarantine although only about six are specific to plants. Once allowed in, plant varieties introduced into China for the first time are subject to further strict requirements.

Generally, IP enforcement in China presents an insuperable challenge evinced by the high level of activity in producing counterfeit goods. With regard to PVRs, the Regulations on the Protection of New Varieties of Plants (PVP Regulations) lay out the enforcement options and procedures. In case of infringement of PVRs, a right holder has two options: going through the examining and approving authorities i.e. the Ministry of Agriculture and State Forestry Administration or filing a suit in court. It is reported that more than 800 PVR violation cases have been investigated with 460 cases ending up in Court. Local courts are reported to have addressed over 100 cases by April 2006.

### **3. *Economic Impact of the Implementation Models***

In 2000, the land area dedicated to agricultural plantations amounted to 156 million hectares, of which 108 million ha were sown to food crops, 15 million ha to vegetables and fruits, and the rest to rapeseed and other oil crops, cotton, tea, etc.

The figures compiled by the International Seed Foundation in 2004 reveal the estimated size of the domestic market for seed (US\$ million) to be second largest after the United States. China is a major producer of seeds; however, it still occupies an intermediate position in the international seed trade. This can be explained by the size of domestic demand.

Figures reveal that China has been gradually focusing on horticultural crops (which sell at much higher prices than food crops, and are widely exported, especially to Japan), in particular vegetables. They also show that China has become a net importer of seeds.

The shift from food crops to vegetables makes sense when one considers the relative average seed prices, which tend to be far higher for horticultural crops.

According to IFPRI, the common practice in China is for research institutes or seed development firms to outsource the multiplication of seeds to state-owned seed companies, which in turn contract with individual growers to produce commercial quantities of seeds. Thus, owing to the risks of production of higher quantities by farmers, research institutes and seed development firms are keen on resorting to plant variety protection certificates. After being multiplied, seeds are distributed to farmers mainly by research institutes, state-owned seed companies, extension agents and small traders.

The World Bank had launched in 1990 a programme aimed at introducing modern methods and equipment for producing and handling seeds. Another project run between 1996 and 2003 was concerned with the restructuring of state enterprises, the availability of credit and the use of inputs such as improved varieties. This latter project also involved the drafting of a draft seed sector policy, which was not approved as such by the Chinese government. Thus, the adoption of the Seed Law and of the Regulations on the protection of new varieties of plants was delayed compared to the initial schedule set forth by the World Bank.

In one of the first articles of the Seed Law consists in a declaration that the “State supports the protection of seed resources, and the breeding, production, and dissemination of quality seeds.” This law asserts the State sovereignty over seed resources, whether improved or found in the wild; thus, collection or felling (of trees) are prohibited, unless such activities are carried out for scientific research and provided the approval of the State Council or of local authorities has been obtained. However, the “National People’s Congress encourages and supports entities and individuals to breed and develop quality seeds.” The establishment of a reserve seed system to meet the demand in the event of calamities is contemplated in the Seed Law.

Article 14 provides for special rules for the safety assessment of genetically-modified seeds. Where the applicant is not satisfied with the decision regarding the approval of a particular crop variety, he or she may ask for a second examination by the Examination and Approval Committee of the national or provincial departments of agriculture and forestry.

The government grants two types of licenses: seed production licenses and seed processing licenses. Producer applicants must show that they fulfil certain requirements. For seed processing licenses labels must be affixed on seed bags that indicate the seed variety, name, place of production, quality index, quarantine certificate number, licenses numbers or reference of import approval. Imported seed bags must be labelled in Chinese and show the applying quarantine certificate.

Where a seed user incurs loss due to poor seed quality, he/she is entitled to compensation by the seed supplier amounting to the seed price and the loss of profit. The seed processor can in turn ask for compensation from the seed producer or other seed processors where applicable. The parties to a dispute regarding seed use may seek intermediation, resort to arbitration or directly go to the People's Court.

In situations of emergency, where the crop seeds to be used are of lower quality than the standards set out by the national or local government, their use must be approved by the people's government above county level.

The total number of plant variety rights in force at the end of 2004 amounted to 584, just five years after the entry into force of the law. As of August 2005, 2,518 applications had been received by the Ministry of Agriculture. Whereas in 1999, one-fifth only of the domestic applicants were individuals or companies, their share has risen to 40% in 2004. The IFPRI study outlines the fact that most of the applications are concerned with hybrids, rather than open-pollinated maize and rice varieties, whereas "[a]mong the more than 190 crops for which PVP protection was sought during the past 30 years in the United States, open pollinated crops accounted for the lion's share of applications." The same study estimates that 82% of the PVP applications in China are filed by public agencies.

# CASE STUDY ON INDIA

By Dwijen Rangnekar, Warwick University

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## 1. *Introduction*

This is a study of the ‘impacts’ of implementing Article 27.3(b) of the TRIPs Agreement in India. The study looks at how various international obligations are translated into the architecture of domestic law and analyses the concomitant economic changes that have occurred in plant breeding and the seed industry. India is a useful choice as it a large farming community (65% of the population are dependent on agriculture), an active movement on these issues and an increasingly diverse seed industry with active (often, leading) private sector presence. At the TRIPs Council, India has regularly championed the rights of farmers and the integration of norms and principles from the Convention on Biological Diversity into obligations at the World Trade Organisation. Consequently, studying the way in which this obligation to the TRIPs Agreement is domestically implemented can be a prism into how different domestic (and international) constituencies are handled. The Report analyses the regulatory framework, focussing primarily on the *Protection of Plant Varieties and Farmers’ Right Act, 2001*. As the system is still to be operational, the economic analysis looks at the structural changes that have occurred in the plant breeding and seed industry over the last two decades.

## 2. *The legal framework*

The *Protection of Plant Varieties and Farmers’ Right Act*, in specific, and the wider regulatory space concerning plant materials, in general, are driven by a complex set of principles which are not entirely compatible. At one level there are obligations to the TRIPs Agreement and at another level there are the interests of farmers and farming communities. Within these potentially competing pressures, the Act makes a serious attempt at integrating norms and principles of the Convention on Biological Diversity. This is visible in the requirement for a declaration of prior informed consent, i.e. breeding material has been lawfully acquired (section 18(1)(h), the Act). Further, there are provisions for community rights and a gene fund to make operational farmers’ rights.

In many ways the Indian legislation pioneers a path that is different and distinct from the dominant template for the protection of plant varieties as mapped out by UPOV. This is evident in the script itself. Beyond the evident absence of ‘plant breeders’ right’ in the title, the right to a breeder follows the successful registration of a variety which “shall confer an exclusive right on the breeder” (cf. section 28(1), the Act). A more substantive difference is in the conditions for registration of a variety. While adopting a similar template of ‘novelty, distinctness, uniformity and stability’, the Act differs by its requirement for ‘essential characteristics’. To explain, the requirement for distinctness requires the variety to be “clearly distinguishable by *at least one essential* characteristic from any other variety whose existence is a matter of common knowledge” (section 15(3)(b), the Act, emphasis added). ‘Essential characteristics’ is defined in Article 2 (of the Act) to encompass characteristics that “contribute to the principal features, performance or value of the plant variety”; thus substantively different from the procedural treatment of UPOV.

The scope of protection is similar to the scope offered under the 1978 Act of UPOV. The difference is its categorisation of the UPOV exemption for breeders as a ‘researchers’ right’; thus awarding it a particularly important status. However, it is in providing farmers’ rights that the Indian law truly pioneers a different path. The following components constitute farmers’ rights:

- A farmer who has bred or developed a new variety shall be entitled to registration and treatment (i.e. protection) in a manner akin to a breeder
- A farmers’ variety is entitled to be registered if it fulfils all requirements
- A farmer engaged in conservation and improvement of genetic resources shall be entitled to recognition and reward from the Gene Fund
- A farmer is entitled to save, use, sow, resow, exchange, share or sell his farm produce including seed of a protected variety provided that the farmer does not sell branded seed of the variety.

There are other provisions that support farmers’ rights, such as protection against innocent infringement (section 42). Farmers are protected from alleged infringement when it can be established that “at the time of such infringement [the farmer] was not aware of the existence of such right” (section 42(i), the Act).

An authority is to be set up to administer the Act. The Act also provides for various public interest measures which include a comprehensive ban on varieties that include technologies that are injurious life and health of human beings, animals or plants.

Given the historicity of the Patent Act, 1970, there is no explicit mention of biotechnology or phraseology that might allude to the attempts to demarcate the micro- from the macro-biological as pioneered in the Strasbourg Convention. However, in Section 2, where various definitions are expressed, inventions are said to mean “any new and useful [...] (i) art, process, method or manner of manufacture; [...] (ii) machine, apparatus or other article; [...] (iii) substance produced by manufacture, [...] and includes any new and useful improvement of any of them, and an alleged invention” (section 2(j), Patent Act, 1970). Chapter II sets out ‘Inventions not patentable’ which includes ‘prophylactic processes for treatment of humans, animals or plants’ and excludes ‘a method of agriculture or horticulture’. Despite these provisions, case law (e.g. Agracetus transgenic cotton patent dispute of 1994) demonstrates the problems in administering this exclusion.

Following the TRIPs Agreement, the *Patent Act, 1970* underwent three revisions. In the Second amendment, a new clause, 3(j) was inserted: “plants and animals in whole or any part thereof other than micro-organism but including seeds, varieties and species and essentially biological process for production or propagation of plants and animals;”. This paved the way for the *sui generis* option for the protection of plant varieties. It was in the Third amendment that Section 5 (which identified non-patentable inventions) was deleted. Now, patents on microorganisms are possible.

*Seed Market Regulations* are another sphere of regulations. The 1980s form a watershed in the transformation of the Indian seed industry. In 1983 a policy to release publicly bred varieties to the private sector was introduced. In 1987 there was a marked relaxation of industrial licensing regulations and in 1988 a new seed policy was announced. The latter allowed private sector companies to enter the industry across a range of crops and also relaxed the constraints on seed imports.

In 2004 a Seed Bill was introduced in Parliament that seeks to replace the *Seed Act, 1966*. It proposes for all varieties to be registered and meet certain prescribed minimum standards. In establishing these standards, there are measures to back the consumer (i.e. farmer) from fraudulent seedsmen. To promote certified seeds and the certification process, it allows for self-certification. The report reviews some of the

proposals and notes the concern of commentators of a lack of consistency between these provisions and those present in the *Plant Variety and Farmers' Rights Act*.

### **3. Economic Impacts**

The seed industry has historically been the reserve of the public sector – framed by the establishment of the National Seed Corporation in 1963 and the success of the World Bank funded Tarai Seed Development Project that launched the high-yielding varieties in the 1960s. Yet, in the 1960s, small private seed companies were set up – many with technical training from the Rockefeller Foundation and the US Agency for International Development. By 1985, it is estimated that of the 420,000 metric tonnes of seed, the public sector produced 240,000 metric tonnes. The private sector has focussed on crops that have been successfully hybridised: sorghum, pearl millet, maize, cotton, sunflower, and some oilseeds. Many of the seed firms had fledging plant breeding operations and dependent substantially on publicly bred germ plasm – and at times finished varieties. Yet, through the years, the private sector has grown in size and accounted for leading shares. One estimate indicated that hybrid seed market shares of 40% in maize, 70% in pearl millet, 90% in sorghum and over 90% in vegetables. In the early 1990s, data suggests that over 40 seed companies have turnovers valued at US\$500,000. A key large player is the Maharashtra Hybrid Company (Mahyco) valued in the 1990s at over US\$14Mn. Following the liberalisation and other policy changes in the late 1980s, the seed industry has been subject to a phase of mergers and acquisitions initiated by MNCs resulting in significant consolidation: Monsanto has acquired a 26% stake in Mahyco, Agrevo controls 100% of Proagro, Emergent Genetics has acquired 74% stake in Mahendra Hybrids and Pioneer Hybrid has a 51% stake in SPIC. More recent data would suggest a deeper level of mergers and acquisitions. Recent estimates give the (organised) private sector a 67% market share that is valued at US\$3.6Bn.

Private sector R&D spending is estimated at having doubled between 1988 and 1996. Without doubt this research is also driven by its focus on 'proprietary' hybrids – evidenced by the increasing rate of release of hybrid varieties that has accelerated. For example, of the 110 maize hybrids released between 1991/97, 93 were from the private sector. There have been substantial investments in agricultural biotechnology with the private sector investments estimated at US\$10.62Bn. This outstrips the public sector investments of US\$7.37Bn.

For some indigenous firms these structural transformations are difficult to handle. In particular, a fear of technological dependence may be appearing. This builds on their dependence on the public sector for germplasm. However, there are other firms that have entered into technological alliances or form part of the M&A activity.

The research finds the public sector in a complicated position having to confront difficult policy options. There is an opportunity to re-draw the relationship with the private sector. Equally, there are opportunities of using PBRs as an instrument for cost-recovery and revenue generation. Within this mix, a particular observation is striking. In as much as the private sector will tend to focus on hybrids, there is a strong mandate for research on OPVs and on crops and regions that will remain neglected, such as rice and wheat – the two key food crops of the country. It is clear from the Act that the public sector will seek PBRs on their varieties. Thus, the issue of how these varieties will be licensed to seed firms remains. In making its decision, the public sector should take cognition of the impact of this decision on the competitive structure of the industry. The relatively low seed-to-grain price ratio in India is testimony to the elaborate and competent network of seed growers and seed firms. A licensing policy that compromises this network and leads to the exit of seed firms could potentially make the seed market non-competitive.

# CASE STUDY ON TURKEY

By Ivan Ivanov, Burcak Yildiz, Ofelia Tsonkova, Tatiana Mateeva

## IP Bulgaria

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### **1. Introduction**

Turkey's economy is a complex mix of modern industry and commerce along with a traditional agriculture sector that in 2004 still accounted for more than 35% of employment. The sectoral composition of the GDP in 2003 was: agriculture: 11.7%; industry: 29.8%; services: 58.5%. During the last four decades agricultural GDP grew about three times slower than the overall economy, resulting in a declining share of agriculture in GDP from 35% in 1960 to 15% in 2000. The main crops in the Turkish agriculture are wheat, rice, cotton, tea, tobacco, hazelnuts, and fruits.

Turkey's domestic seed production is not sufficient to meet the local demand, despite the privatization of the industry in the 1980s and continued government support. Turkey imported over USD 65 million of seeds in 2004 with the European Union supplying the majority of seeds to Turkey. The United States exported USD 9.1 million worth of seeds to Turkey in 2004, primarily corn, vegetable and fodder crop seeds.

The registration, control and certification facilities of seeds are executed by the Ministry of Agriculture and Rural Affairs (MAFRA), General Directorate of Control and Certification of Seeds. The official body for variety release is the Variety Release Committee. MAFRA enforces seed law. Seven official Seed Testing and Certification Stations are present in the country. Seed processing is performed by public as well as private sector entities. The seed producing organizations market their seeds through their own outlets and agencies. Seed production and marketing activities in the public and private sectors are based on a free market economy. Prices are not controlled. Trade in seed of foreign origin is subject to legal restrictions.

### **2. Domestic law and government policy**

Turkey's application for membership of UPOV has been accepted; however the Great National Assembly of Turkey has not enacted the relevant approval code. Under Turkish law, new varieties of plants are protected by the following legal acts:

- Code on Protection of Breeder's Rights for New Plant Varieties.
- Directive on the Registration of New Plant Varieties
- Directive on Protection of Breeder's Rights for New Plant Varieties

In accordance with Decision No. 1/95 of the EC-Turkey Association Council of December 1995, Turkey has undertaken to align its domestic IP legislation with that of the European Communities. Towards this goal, the Code on Protection of Breeder's Rights for New Plant Varieties was enacted in January 2004. By this Code, the breeders are granted exclusive rights for the first time in Turkish law. Although Turkey has not been a member of UPOV yet, the Code on Protection of Breeder's Rights for New Plant Varieties is [predicated on UPOV](#) 1991. Beside the UPOV Convention, The Code numbered 5042 is also in conformity with the [Acquis Communautaire](#). It is especially [predicated on the](#) 2100/94/EC, 1768/95/EC ve 2470/96/EC regulations of EC. The duration of protection is 25 years from the grant of the right. For trees, vines and potatoes, the said period is 30 years from the said date. When an application is complete and accurate it is entered in the register and given an application number. The ministry examines the registration procedures in order to ensure validity of the certificate.

Accordingly, for the purposes of protecting and safeguarding agricultural production, farmers are authorized to use for new production, on their own holdings, the product of the harvest which they have obtained by planting propagating material of a protected variety, except hybrid and synthetic varieties, without infringing the legitimate rights of breeder, provided that it is not contrary to paragraph 1 of Article 14. This rule applies to a list of species.

In Decree No. 551 Relating to the Protection of Patents, plant varieties do not fall under the patent system and cannot be protected by the provisions on patents

Turkish legislation on seeds is generally compatible with EU. Sampling and laboratory analyses are done under the ISTA Rules both in Turkey and EU. The variety registration for all species are also carried out under the UPOV Rules both in Turkey

and EU. Although the recent seed legislation in Turkey is adequate to the European law, a new Draft Seed Law is on the agenda of the Parliament. The main purpose of this Law is to give the private sector more control of the seed industry. According to the draft Law, an independent Turkish Seed Industry Union will be established and given a significant portion of the duties and responsibilities currently under MARA. Industry representatives expect the law to be adopted in 2006. The GOT is also developing a National Biosafety Law (NBL). The law will focus on the production, use, importation and distribution of genetically modified materials. For seeds, the Law will provide a framework on the production and marketing of transgenic seeds should be possible. Currently, the GOT does not permit planting of bio-engineered seeds. Utilization of certified seed has not developed well in Turkey, even though the GOT supports their use. However, certified seed use is expected to increase in the future in response to growing demand. The growth is expected especially for greenhouse vegetable, corn, sunflower, and fodder crop seeds.

### **3. *Economic Factors***

There are 128 private firms and 27 public entities that currently produce, procure, import and distribute seeds in Turkey. However, Turkey's domestic seed production is not sufficient to meet local demand especially for vegetables, fodder crops, pasture and meadow grasses, corn seeds, and seed potatoes. A private seed industry has been a relatively recent phenomenon in Turkey. Turkey became a member of the OECD certification system and International Seed Testing Association (ISTA) just a few years ago. In the past, the industry was dominated by government agencies, which even set selling prices until the 1980's when the sector was privatized and seed prices were liberalized. Local and international companies began investing in the seed sector shortly after that. The Turkish Seed Industry Association (TURK-TED) was established in 1986. The major function of TURK-TED is acting as powerful lobbying agent, contributing to the development of the sector, and assisting with the transition to the EU system. TURK-TED also assists member firms with studies on seed production, certification, storage, packaging, distribution, and variety breeding. TURK-TED currently has 75 members, which account for at least 90 percent of all private sector seed production. In 2004, privately owned firms produced either 100 percent or almost 100 percent of sunflower seeds, vegetable seeds, corn seeds, and seed potatoes. Slightly more than 50 percent of fodder crop seeds, 20 percent of cottonseeds, 15

percent of barley seeds, and 5 percent of wheat seeds were also produced by the private sector in Turkey.

The Production and Development General Directorate (TUGEM) of the Ministry of Agriculture announces a Production Programme, which sets production goals for the Turkish sector each year. The programme is established jointly with both public and private seed producers based on the country's domestic needs as well as export goals. Even though they are significantly reduced, illegal entries of expensive greenhouse vegetable seeds continue to create unfair competition against firms, which are investing in this sector.

Certified seed utilization has not developed well primarily due to the lack of the education on the part of farmers and economic situation in Turkey. Nonetheless, certified seed utilization is expected to grow in the future in response to growing demand, especially for greenhouse vegetable and corn seeds. Demand for hybrid sunflower and fodder crop seeds are also expected to increase.

Due to shortfalls in production and quality, Turkey must import most seed varieties. Corn, sunflower, cotton, vegetable, and fodder crop seeds as well as seed potatoes are the most prominent imports. Depending on supply and demand, other seed varieties may also need to be imported. The current regulation on Plant Quarantine hinders imports of seed and has created significant problems. All imported seed must be tested. Tests on imports take long time, usually about a week, because customs do not have laboratories and samples are sent to the nearest research institutes. This time is even longer, if there is a dispute on findings since reference laboratory is in Ankara. Some new laboratories at customs were set up recently and some others were planned which will hopefully alleviate the situation. Importers also need import licenses to import seed and only those firms, which are producing, procuring, and marketing seeds domestically are provided import licenses. Turkey imported approximately 27 TMT of planting seeds worth approximately USD 69 million in 2004. During the first nine months of 2005, Turkey imported approximately 25 TMT of seeds worth of approximately USD 72 million. The value of vegetable seed imports decreased from approximately USD 1.9 million in 2004 to approximately USD 1.0 million during the first nine months in 2005. Similarly, the value of fodder crop seed imports decreased from approximately USD 1.0 million in 2004 to USD 269,000 during the same period.

However, the value of corn seed imports increased during the same period from approximately USD 6 million to approximately USD 6.9 million.

Turkey exported approximately 19 TMT of seeds worth approximately USD 31 million in 2004. However, Turkey exported fewer seeds, approximately 6.8 TMT worth approximately USD 19 million during the first nine months of 2005. Decreases were especially significant in corn seeds because, due to large demand, producers preferred to market their production in Turkey. On the other hand, exports of cottonseeds in 2005 are exceeding exports in 2004- second year in a row.

TIGEM is the only public entity involved in the seed trade. TIGEM imported 40 MT parent wheat seeds from France and Italy, but did not export any seeds in 2004. In 2005, TIGEM imported 20 MT of parent wheat seed from France and exported 10 MT of wheat seed to Azerbaijan.

The approach of Turkey to modern biotechnology practices is supportive as a part of its general policy on transfer and development of technology. However she wants to ensure the safety of both technology itself and its products in terms of introduction into the environment and use in consumption purposes. As stated in the report prepared by SPO (State Planning Organization), agricultural biotechnology has the highest priority among the subjects considered for the research and development purposes. Within agricultural biotechnology plants has the highest priority.